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ART. V.—*Abstract of a Discourse, by* DR. FALCONER, *on the Fossil Fauna of the Sewalik Hills.*

Two evening meetings of the Royal Asiatic Society were held at the Society's Rooms, in Grafton-Street, on the 1st and 8th of June, when Dr. Hugh Falconer gave a discourse, in two lectures, on the ancient animal races of India, as indicated by the Fossil Fauna of the Sewalik hills. The first meeting was occupied with a general description of the Sewalik fossil animals. Dr. Falconer referred to the antiquity of the human race in India, and the spreading of its mythology, arts, and sciences, over other nations: they had extended to Greece and Italy through Egypt. There is a limit to antiquarian research, at the point where we cease to have indications of the human race. If we desire to dive further into antiquity, we have to fall back on the monuments and inscriptions constructed by nature, on the fossil remains of the extinct races of animals which formerly peopled the earth. Some of the Sewalik fossils appear to afford grounds for entertaining the presumption that it may be possible to connect the human epoch with very remote times. The *Colossochelys Atlas*, or gigantic fossil tortoise of India, discovered by Captain Cautley and Dr. Falconer, supplies a fit representative of the tortoise which sustained the elephant and the infant world in the fables of the Pythagorean and Hindu cosmogonies. It is a point of great interest to trace back to a probable source, a matter of belief like this, so widely connected with the speculations of an early period of the human race. Dr. Falconer gave a brief historical account of the discovery of fossil remains of extinct mammalia in India, commencing with the incident mentioned in Ferishta's history, during the reign of Feroz Toghlukí, A D. 1360; the discoveries of Captain Webb and Mr. Henry Colebrooke, in the elevated plain of Tibet; the Irrawaddi remains met with by Mr. Crawford, and described by Mr. Clift; the Sewalik fossils discovered by Captain Cautley and Dr. Falconer, Captains Baker and Durand, and Colonel Colvin; the Norbudda fossils, by Dr. Spilsbury; the Gulf of Cambay fossils, by Dr. Lush and Lieutenant Fitzjames; and the Jumna fossils, by Serjeant Dean. Dr. Falconer then briefly described and exhibited specimens of the most remarkable fossil species. There were no less than five extinct species of mastodon and elephant; viz.: the *Mastodon latidens*, (Clift); *M. Elephantoides*, (Clift); *M. Sivalensis*, (Falc. and Caut.); *Elephas quadrifrons*, (F. and C.); and *E. Hysudrensis*, (C. and

F.): the Sewalik fossils showing that these so-called genera are undistinguishable through any characters derived from the form and structure of the teeth. Then followed the fossil species of Rhinoceros, the Hexaprotodon hippopotami, Merycopotamus, (Caut. and Falc.) a remarkable new genus; Anoplotherium Sivalense; several species of Sus, and three species of the genus Equus. There were nearly as many fossil species of mastodon and elephant, as there are now species of the whole order of Pachydermata upon the continent of India. The fossil Ruminants were then described. They were surprisingly rich, including almost every type, fossil or recent, known in the order; viz., two species of Giraffe, *Camelopardalis Sivalensis*, (Falc. and Caut.), and *C. affinis*, (C. and F.); species of Camel, Deer, Antelope, Musk, *Bos*, *Bubalus*, *Bison*, in a great variety of forms, and the colossal ruminant, *Sivatherium giganteum*, (C. and F.), bearing four horns, and nearly approaching the elephant in size. The Sivatherium was illustrated with a full-sized restored diagram of the head.

The Carnivora were described as comprehending fossil species of Felis, Hyena, Canis, Mustelidæ, Machairodus, and the new forms of Hyænarctos, and Enhydriodon (F. and C.) There were several fossil species of Quadrumana, and forms of Rodentia and Insectivora. The Sewalik Reptilia were exceedingly rich in forms, particularly of the Crocodiles and Chelonians, some of which were undistinguishable from existing species; while the *Colossochelys Atlas* tortoise is a prodigy of size in the order. It was in every part of its organization a true land tortoise; estimated from numerous remains, to have had a shell twelve feet long, and six feet high. This colossal reptile has lately been described in a communication to the Zoological Society; and was illustrated by an excellent restored diagram of the inferred natural size, by Mr. Scharf, eighteen feet long. Dr. Falconer speculated on the possible connexion of this fossil form with the gigantic tortoise which figures so prominently in the Pythagorean and Hindu cosmogonies.

In his second lecture, on the 8th instant, Dr. Falconer gave the general conclusions drawn from the Sewalik Fossil Fauna, and its bearings on the climate, geography, and geological changes of ancient India. The first prominent character was the wonderful variety of forms. It seemed as if all the geographical divisions of the old continent, and every geological epoch from the older tertiaries down to the modern, had contributed representatives to form one comprehensive fauna in ancient India. Monkeys, Camels, Giraffes, &c., were mixed up with Anoplotherium, Sivatherium, &c. All the mammiferous remains which had been gone fully into, belonged to extinct species; while some, in regard to which the evidence was incomplete, came very near to existing species, and might ultimately prove to be identical with them. Some of the reptilian forms appeared to be identical with existing forms. The Sewalik Fauna was remarkable for a general peculiarity of type, and for the number of transitionary forms contained in it. Half of it exhibits a parallel representation of the existing Fauna of India, and the remainder represented the forms met with in the older tertiaries. It contained, so far as the inquiries had yet gone, no species of the Marsupial, Edentate, or Cetaceous orders. The abundance of the remains in the Sewalik strata was indicated by the immense extent of the collections. That which Captain Cautley had munificently presented to the British Museum, amounted to about two hundred chests, averaging about four hundredweight of contents each, while other collections, nearly equal in extent, were formed by Captains Baker and Durand, Dr. Falconer, Colonel Colvin, and others.

Dr. Falconer then gave the geological and climatal bearings of the question. The continent of India, at an early period of the tertiary epoch, appears to have been a large island, situated in a bight formed by the Himalayas and Hindoo Koosh ranges. The valleys of the Ganges and Indus formed a long estuary straight into which the drainage of the Himalayas poured its silt and alluvium. An upheavement took place, which converted these straits into the plains of India, connecting them with the ancient island, and forming the existing continent. The Sewalik Fauna then spread over the continent, from the Irrawaddi to the mouths of the Indus, two thousand miles; and, north-west, to the Jhelum, fifteen hundred miles. After a long interval of repose, another great upheavement followed, which threw up a strip of the plains of India forming the Sewalik Hills, and increased the elevation of the Himalayas by many thousand feet. This event, and the climatal changes which it involved, caused the extinction of the Tibetan and Sewalik Faunas. Dr. Falconer then discussed the climatal conditions of the case, and the changes implicated in these upheavements. He inferred that India is now enjoying "the summer of the great cycle;" that, in contrast with what has taken place in Europe, there has been no decrease of temperature in that country, which has now as warm a climate, if not warmer, than it ever had, during any part of the tertiary period. He endeavoured to show that the Sewalik Fauna may have lived through a period equal to that occupied by several divisions of the tertiary epoch in Europe. A great addition to the height of the Himalayas was inferred to have been made at a very late period.

At the conclusion of the lecture, CHARLES LYELL, Esq., at the invitation of the President of the Society, made some remarks on the subject of Dr. Falconer's discoveries. He said he could bear ample testimony to the value of the discoveries made by Dr. Falconer and his coadjutors in India, and expressed his belief that no Government expedition in a distant country had ever done more than they had by their private exertions to enlarge our knowledge of Natural History and Geology, and enrich our national Museum with important treasures. Dr. Falconer and Captain Cautley had been separated from the rest of the scientific world, when prosecuting their investigations, and had no access to large libraries or collections of osteology, while they were determining the specific characters of new fossil animals, and founding new genera, some of which supplied links, as they had pointed out, between widely distant genera, or families previously known. It is therefore highly creditable to their skill and scientific acquirements, that the justness of their views and determinations had since been confirmed by Mr. Owen, and other eminent comparative anatomists in Europe. This collection of organic remains from the Sowalik hills derives a novel and peculiar interest from the circumstance of their affording the first example of a large number of fossil Vertebrata (with very few exceptions of extinct species) procured from a country where the climate may be presumed to be as hot now, as at the period when the fossil animals flourished. The fact of some of these Sub-Himalayan fossil Vertebrata having been ascertained by Dr. Falconer to be identical with species still living in the same region, may perhaps be explained by a considerable similarity of temperature in ancient and modern times. Nevertheless Mr. Lyell conceives that intermediate changes of climate may have been among the most influential causes which exterminated the greater part of the Fossil Fauna of the Sowalik hills, and he suggests that the colder temperature of that comparatively modern era, when erratic blocks were drifted by ice from the poles towards lower latitudes in both hemispheres, may have destroyed numerous species in India.

To determine the relative age of the Sowalik fossils, a more careful comparison of the fossil shells brought home by Dr. Falconer with a larger collection than we yet possess in London of recent Indian species, will be necessary. So far as they have yet been compared a decided majority of the fossils appear to be of extinct or unknown species, and Mr. Lyell would not be surprised if the Sowalik strata should prove to belong to the older Pliocene, or even the Miocene period, in which latter epoch in Europe the Palæotherium lived contemporaneously with the Mastodon, Elephant, Hippopotamus, Dinotherium, Ape, Crocodile, and other recent and extinct genera of mammalia and reptiles, constituting a Fauna in many points analogous, and scarcely less rich or remarkable than that of which the remains have been so successfully investigated by Dr. Falconer and others in India. Mr. Lyell concluded by expressing a hope that the results of these elaborate researches would speedily be made known to the public, and that the Government and East India Company would contribute funds towards the Osteological and other necessary illustrations.

The MARQUIS of NORTHAMPTON begged to say a few words on the important nature of the discoveries which had just been laid before them, in addition to the able observations of Mr. Lyell. It was fortunate, he said, that these discoveries were made in a region which formed a portion of a civilized empire, so that they might not be lost as soon as found, but communicated to the world. The situation of our country—"penitus toto orbe divisa"—made it more incumbent upon us as a nation to publish the results of our scientific enterprises: we were less accessible than the other countries of Europe; and although at this moment we were honoured by the presence of an Emperor and a King on our shores, such visits were necessarily few and far between. He thought that the publication of such extensive investigations and important discoveries, as those of Captain Cautley and Dr. Falconer, in geology, should be matter of national concern; and, as President of the Royal Society, and one of the trustees of the British Museum, he felt it incumbent upon him to express his opinion, that the learned Societies of England should unite to call upon the Government of the country to afford means for so doing; and he had little doubt that the call would be successful. He would not sit down without expressing his sincere thanks to Dr. Falconer, for the intellectual treat he had afforded his hearers.

LORD AUCKLAND concurred fully with the noble Marquis; and said that the Royal Asiatic Society would be most happy to co-operate with the Royal Society, or with any other institution, in furthering so valuable an enterprise.